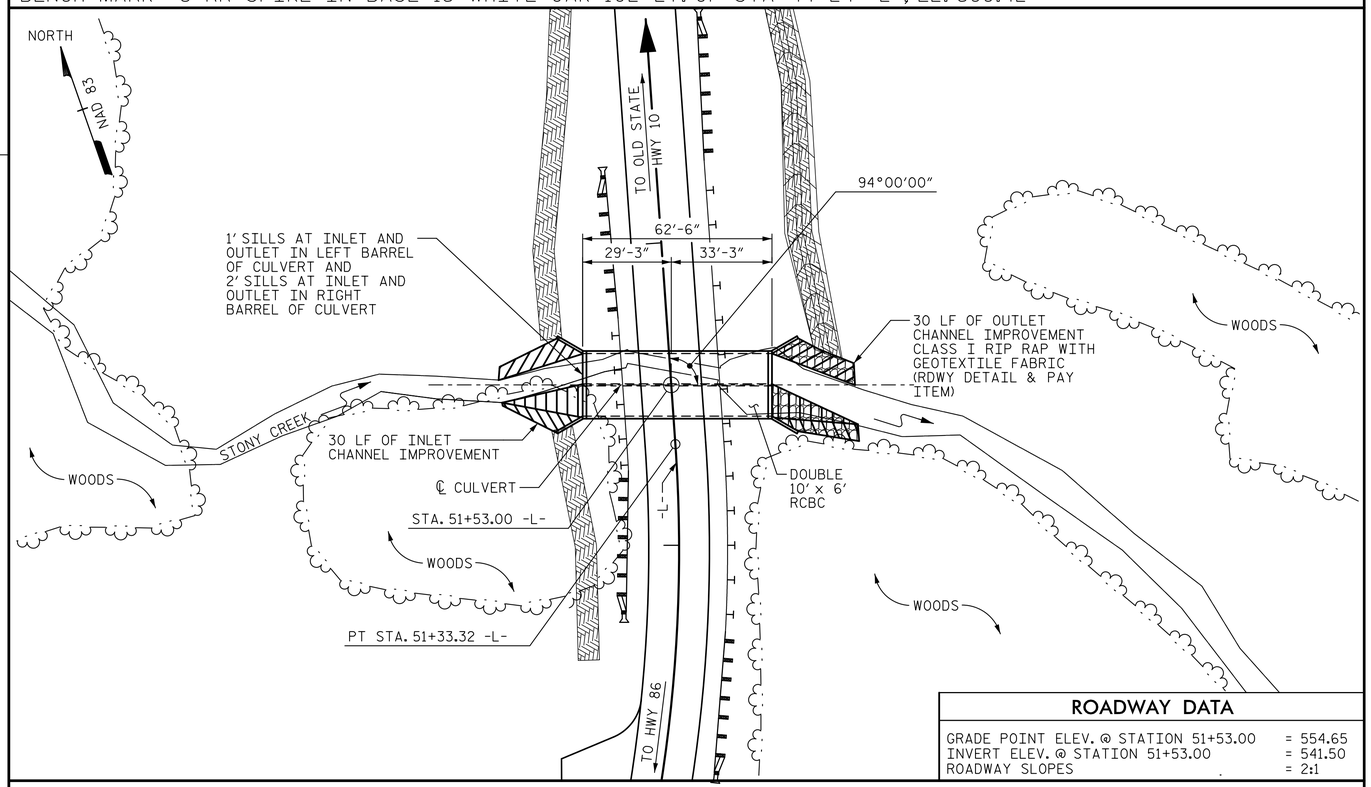
DICN 0660DEL_P210

BENCH MARK #3 RR SPIKE IN BASE 15" WHITE OAK 102' LT. OF STA 44+24 -L-, EL. 599.42

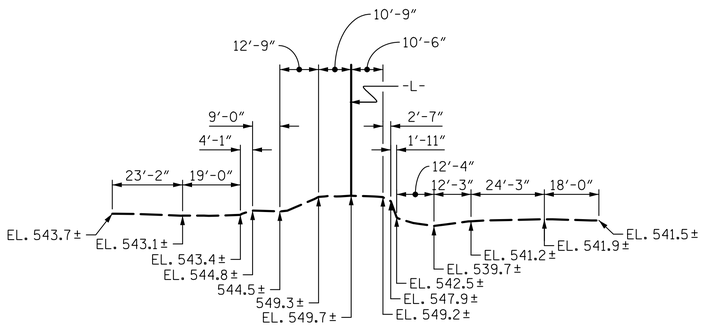


ROADWAY DATA

GRADE POINT ELEV. @ STATION 51+53.00	= 554.65
INVERT ELEV. @ STATION 51+53.00	= 541.50
ROADWAY SLOPES	= 2:1

LOCATION SKETCH

FOR UTILITY INFORMATION, SEE UTILITY PLANS AND SPECIAL PROVISIONS.



PROFILE ALONG ℄ CULVERT

TOTAL STRUCTURE QUANTITIES

CLASS A CONCRETE		
BARREL @ 2.043 CY/FT	127.7	C.Y.
WINGS, ETC.	18.3	C.Y.
SILLS/BAFFLES	2.2	C.Y.
TOTAL	148.2	C.Y.
REINFORCING STEEL		
BARREL, SILLS, BAFFLES	25,033	LBS.
WINGS, ETC.	793	LBS.
TOTAL	25,826	LBS.
FOUNDATION CONDITIONING MATERIAL	98	TONS
CULVERT EXCAVATION	LUMP	SUM
PLACEMENT OF NATIVE STREAM BED MATERIAL	LUMP	SUM

HYDRAULIC DATA

DESIGN DISCHARGE	= 700 CFS
FREQUENCY OF DESIGN FLOOD	= 25 YR.
DESIGN HIGH WATER ELEVATION	= 550.7
DRAINAGE AREA	= 0.77 SQ MI
BASE DISCHARGE (Q 100)	= 950 CFS
BASE HIGH WATER ELEVATION	= 550.93

OVERTOPPING FLOOD DATA

OVERTOPPING DISCHARGE	= 1,266 CFS
FREQUENCY OF OVERTOPPING FLOOD	= 500 YR -
OVERTOPPING FLOOD ELEVATION	= 554.3

NOTES

ASSUMED LIVE LOAD = HL-93 OR ALTERNATE LOADING.

DESIGN FILL = 6.92'

STEEL IN THE BOTTOM SLAB MAY BE SPLICED AT THE PERMITTED JOINT AT THE CONTRACTOR'S OPTION. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.

FOR CULVERT DIVERSION DETAILS AND PAY ITEM, SEE EROSION CONTROL PLANS.

A 3 FOOT STRIP OF GEOTEXTILE SHALL BE ATTACHED TO THE FILL FACE OF THE WING COVERING THE ENTIRE LENGTH OF THE EXPANSION JOINT.

CONCRETE IN CULVERTS TO BE POURED IN THE FOLLOWING ORDER:

1. WING FOOTINGS AND FLOOR SLAB INCLUDING 4" OF ALL VERTICAL WALLS.
2. THE REMAINING PORTIONS OF THE WALLS, SILLS AND WINGS FULL HEIGHT FOLLOWED BY ROOF SLAB AND HEADWALLS.

THE RESIDENT ENGINEER SHALL CHECK THE LENGTH OF CULVERT BEFORE STAKING IT OUT TO MAKE CERTAIN THAT IT WILL PROPERLY TAKE CARE OF THE FILL.

DIMENSIONS FOR WING LAYOUT AS WELL AS ADDITIONAL REINFORCING STEEL EMBEDDED IN BARREL ARE SHOWN ON WING SHEET.

AT THE CONTRACTOR'S OPTION, HE MAY SPLICE THE VERTICAL REINFORCING STEEL IN THE INTERIOR FACE OF EXTERIOR WALLS AND BOTH FACES OF INTERIOR WALL ABOVE LOWER WALL CONSTRUCTION JOINT. THE SPLICE LENGTH SHALL BE AS PROVIDED IN THE SPLICE LENGTH CHART SHOWN ON THE PLANS. EXTRA WEIGHT OF STEEL DUE TO THE SPLICES SHALL BE PAID FOR BY THE CONTRACTOR.

FOR SUBMITTAL OF WORKING DRAWINGS, SEE SPECIAL PROVISIONS.

FOR FALSEWORK AND FORMWORK, SEE SPECIAL PROVISIONS.

FOR GROUT FOR STRUCTURES, SEE SPECIAL PROVISIONS.

FOR CRANE SAFETY, SEE SPECIAL PROVISIONS.

3"Ø WEEP HOLES INDICATED TO BE IN ACCORDANCE WITH THE SPECIFICATIONS.

NATIVE STREAM BED MATERIAL SHALL BE USED TO BACKFILL THE CULVERT BETWEEN SILLS AND BAFFLES. SEE SPECIAL PROVISIONS FOR "PLACEMENT OF NATIVE STREAM BED MATERIAL."

AT THE CONTRACTOR'S OPTION HE MAY SUBMIT, TO THE ENGINEER FOR APPROVAL, DESIGN AND DETAIL DRAWINGS FOR A PRECAST REINFORCED CONCRETE BOX CULVERT IN LIEU OF THE CAST-IN-PLACE CULVERT SHOWN ON THE PLANS. THE DESIGN SHALL PROVIDE THE SAME SIZE AND NUMBER OF BARRELS AS USED ON THE CAST-IN-PLACE DESIGN. FOR OPTIONAL PRECAST REINFORCED CONCRETE BOX CULVERT, SEE SPECIAL PROVISIONS.

PROJECT NO. P-4405K

ORANGE COUNTY

STATION: 51+53.00 -L-

SHEET 1 OF 5 CULVERT NO. 670343

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL STANDARD DOUBLE 10 FT. X 6 FT. CONCRETE BOX CULVERT 94° SKEW

NORTH CAROLINA PROFESSIONAL SEAL 43031 ENGINEER MATTHEW T. NEITHEISEL

DocuSigned by: Matthew T. Neitheisel 84E3BF9E30749E...
2/23/2016

ICA Engineering
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0238

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1			3				TOTAL SHEETS
2			4				5

STD. NO. CB12A

ASSEMBLED BY : D. H. CARTER	DATE : JAN 2016	SPECIAL
CHECKED BY : M. T. NEITHEISEL	DATE : JAN 2016	
DRAWN BY : R.W. WRIGHT	DATE : JULY, 1990	STANDARD
CHECKED BY : D.A. GLADDEN	DATE : JULY, 1990	

2/23/2016
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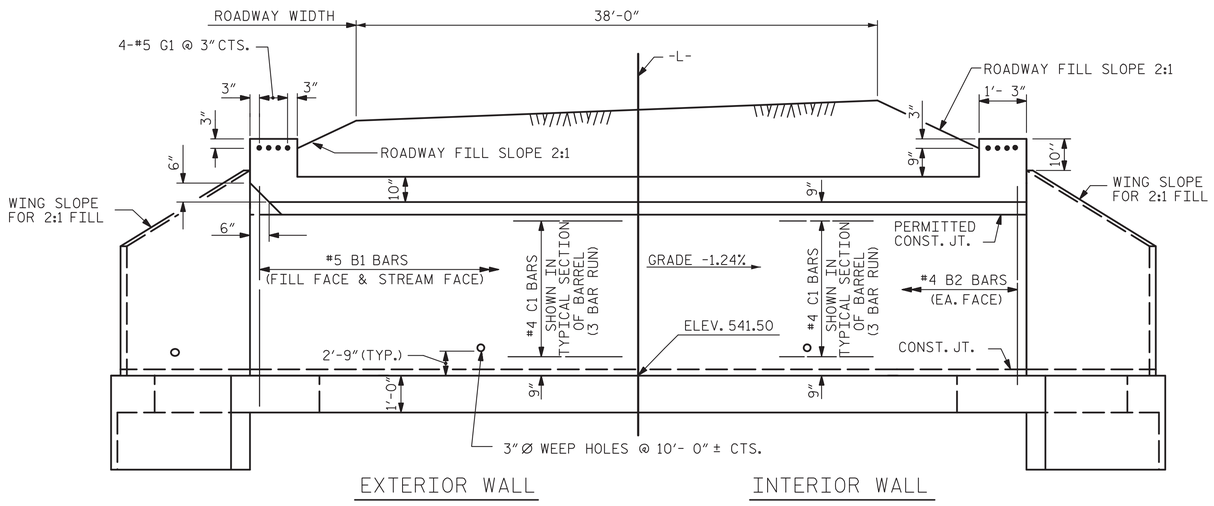
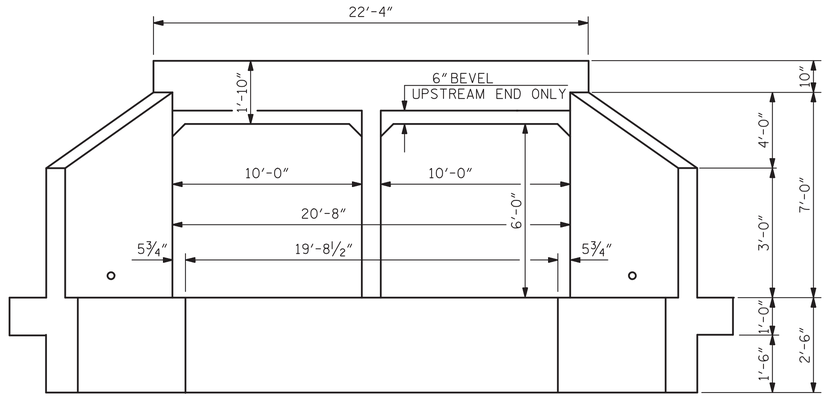
ICA Engineering

0660DEL_P210

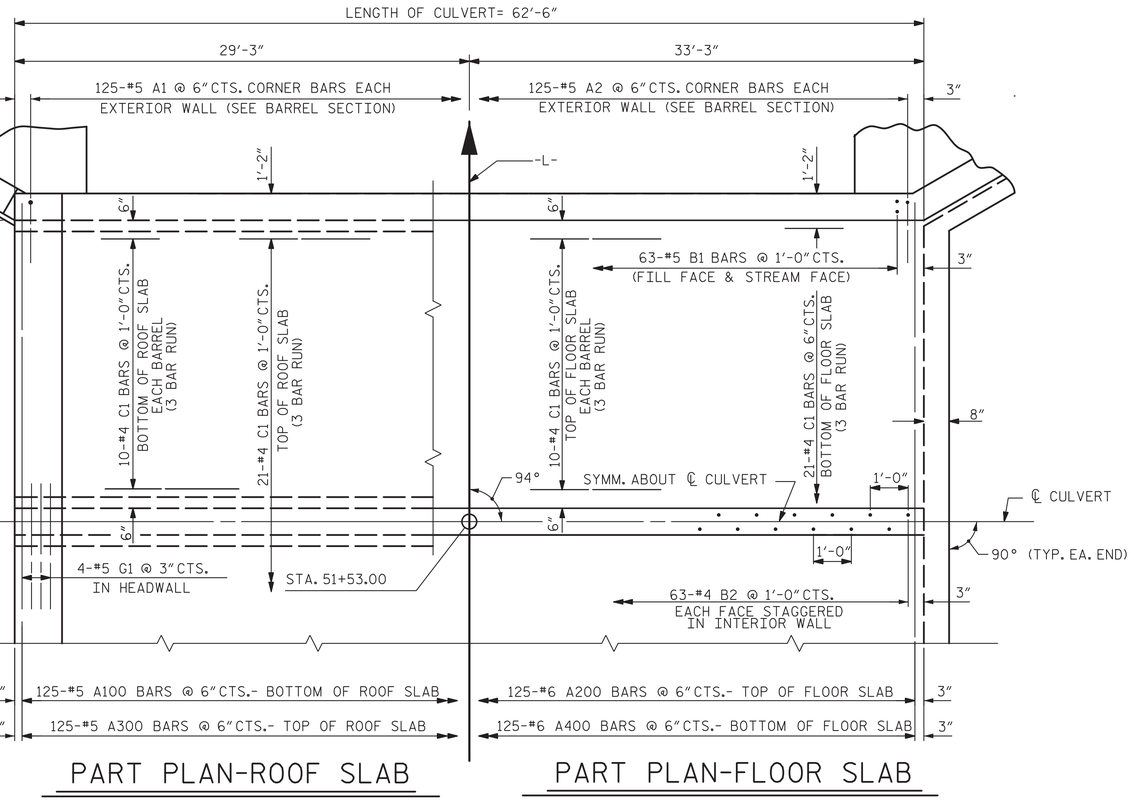
DRAWN



CULVERT SECTION NORMAL TO ROADWAY



END ELEVATION



PART PLAN-ROOF SLAB

PART PLAN-FLOOR SLAB

REVISED 11-19-99 BY M.M. CHECKED BY R.W.W.
REDRAWN NOV.1990 BY TSS CHECKED BY ARB

ASSEMBLED BY : D. H. CARTER	DATE : JAN 2016	SPECIAL	
CHECKED BY : M. T. NEITHEISEL	DATE : JAN 2016		
DRAWN BY : RALPH D. UNDERWOOD	DATE : MAY 1971	STANDARD	
CHECKED BY : JOEL A. JOHNSON	DATE : JULY 1971		

PROJECT NO. P-4405K

ORANGE COUNTY

STATION: 51+53.00 -L-

SHEET 2 OF 5

NORTH CAROLINA PROFESSIONAL SEAL 43031 ENGINEER MATTHEW T. NEITHEISEL

DocuSigned by: Matthew T. Neitheisel 84E31BF9E30749E...

2/18/2016

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5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: P-0258

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STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

BARREL STANDARD DOUBLE 10 FT. X 6 FT. CONCRETE BOX CULVERT 94° SKEW

REVISIONS						SHEET NO.
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STD. NO. CB12

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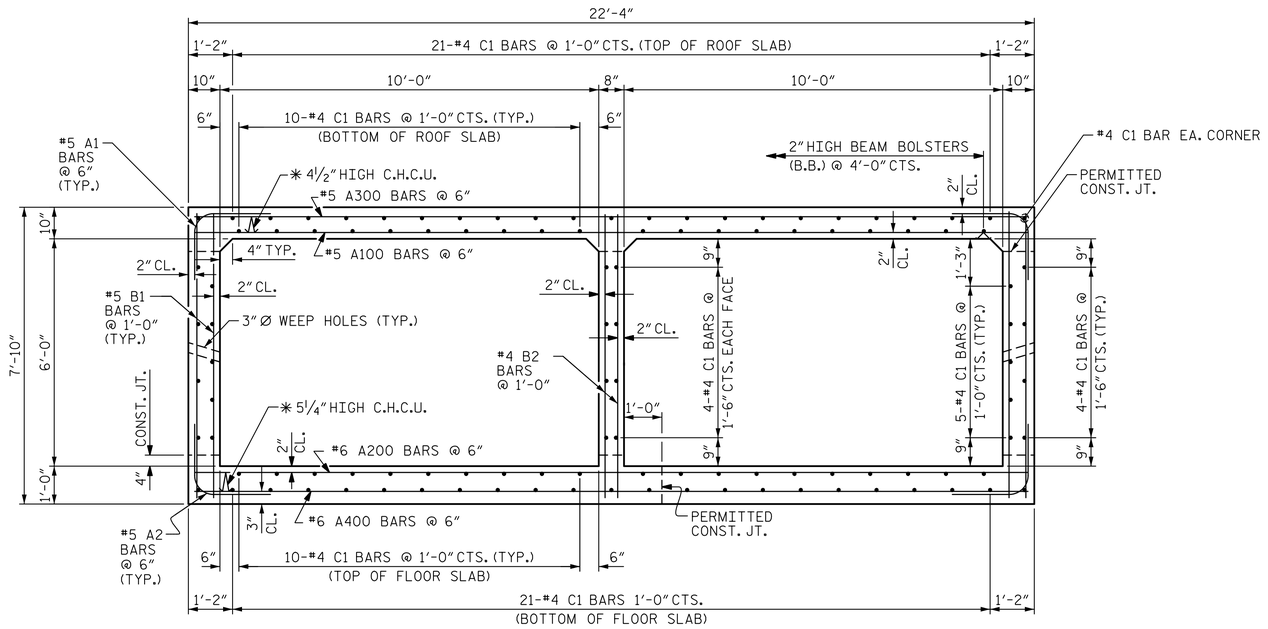
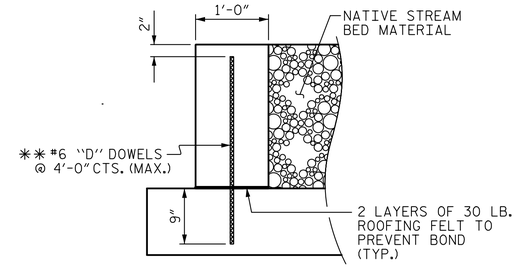
0660DEL_P21o

DSCN



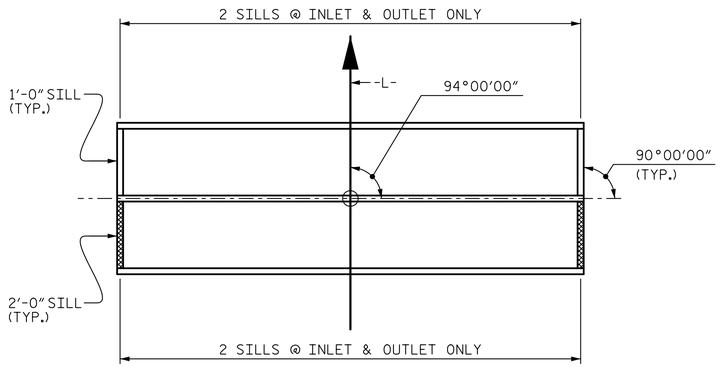
RIGHT ANGLE SECTION OF BARREL

THERE ARE 112 "C" BARS IN SECTION OF BARREL.
* ALL CONTINUOUS HIGH CHAIR UPPER (C.H.C.U.) @ 3'-0" CTS.

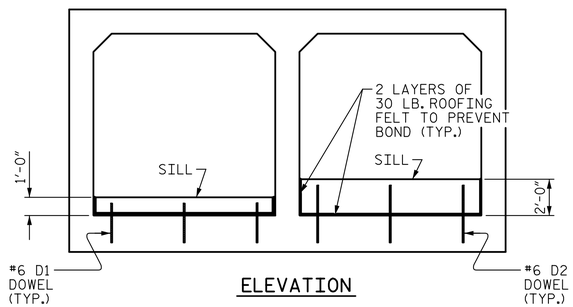


SECTION

** DOWELS MAY BE PUSHED INTO GREEN CONCRETE AFTER SLAB HAS BEEN FLOAT FINISHED.



PLAN VIEW SHOWING SILL LOCATIONS

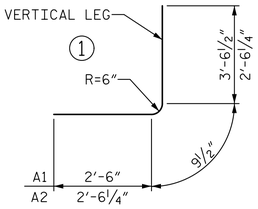


ELEVATION

SILL DETAILS

(LOOKING DOWN STREAM)

BAR TYPES



BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
A1	250	#5	1	6'-10"	1782
A2	250	#5	1	5'-10"	1521
A100	125	#5	STR	22'-0"	2868
A200	125	#6	STR	22'-0"	4131
A300	125	#5	STR	22'-0"	2868
A400	125	#6	STR	22'-0"	4131
B1	252	#5	STR	7'-5"	1949
B2	126	#4	STR	7'-5"	624
C1	336	#4	STR	22'-0"	4938
D1	6	#6	STR	1'-7"	14
D2	6	#6	STR	2'-7"	23
G1	8	#5	STR	22'-0"	184

REINFORCING STEEL 25,033 LBS

CLASS A CONCRETE
CULVERT 127.7 CY
BAFFLES, SILLS 2.2 CY
TOTAL 129.9 CY

SPLICE LENGTH CHART

BAR	SIZE	SPLICE LENGTH
A200	#6	3'-1"
A400	#6	2'-3"
B1	#5	1'-9"
B2	#4	1'-5"
C1	#4	1'-11"

PROJECT NO. P-4405K

ORANGE COUNTY

STATION: 51+53.00 -L-

SHEET 3 OF 5

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

CULVERT DETAILS

NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 43031 MATTHEW T. NEIHEISEL

DocuSigned by: Matthew T. Neiheisel 84E31BF9E30749E...

2/22/2016

ICA Engineering
5121 Kingdom Way, Suite 100 Raleigh, NC 27607
NC License No: F-0258

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DRAWN BY : D. H. CARTER DATE : JAN 2016
CHECKED BY : T. E. TALLMAN DATE : JAN 2016
DESIGN ENGINEER OF RECORD: M. T. NEIHEISEL DATE : JAN 2016

2/22/2016
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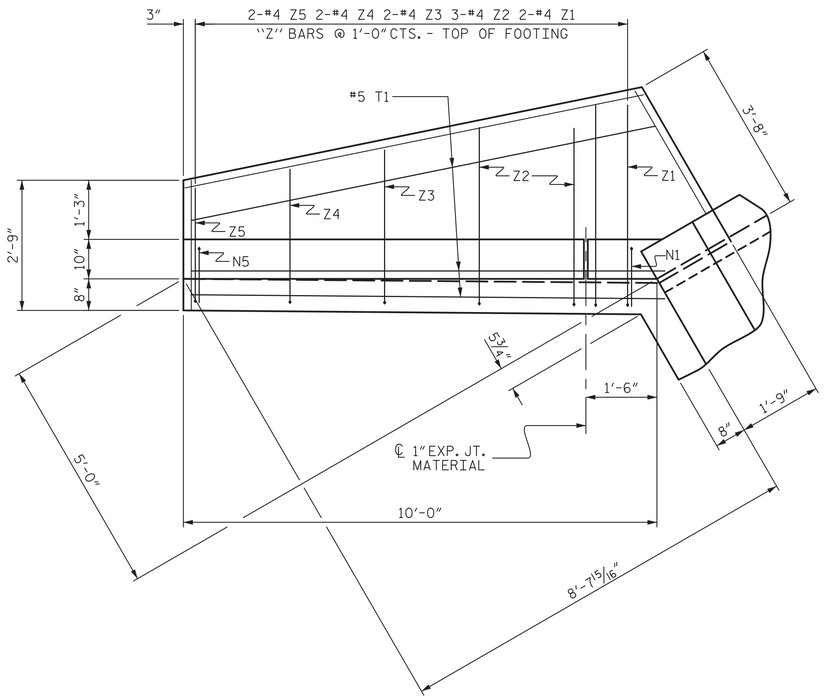
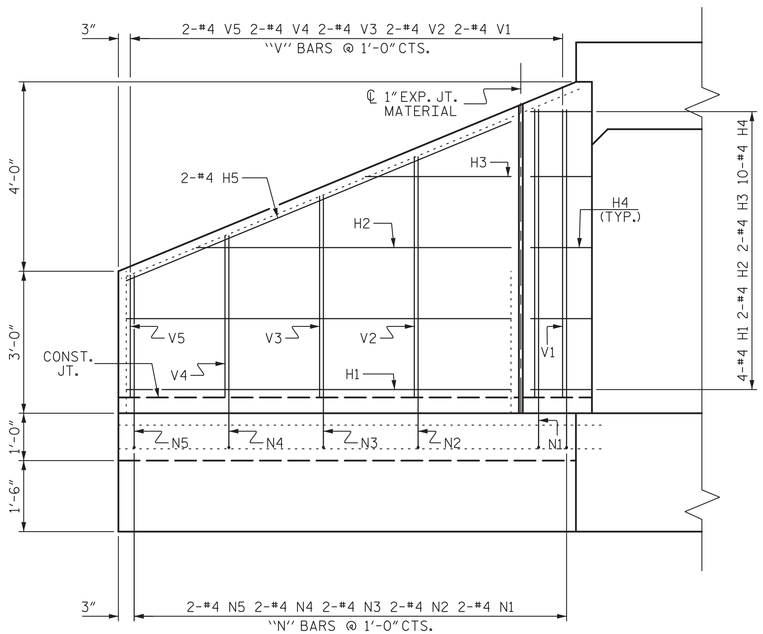
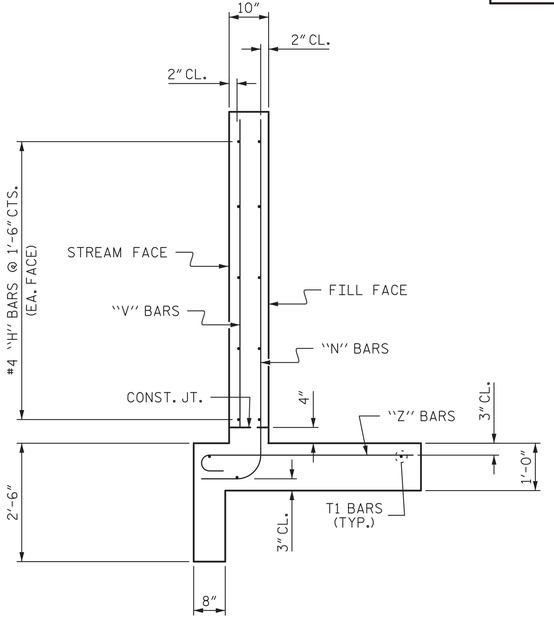
DICK



PLAN



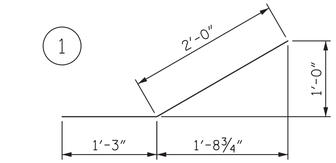
ELEVATION

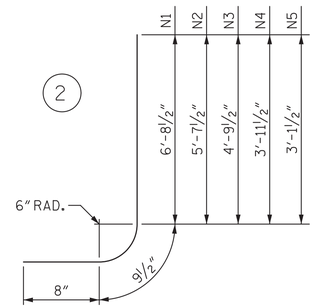


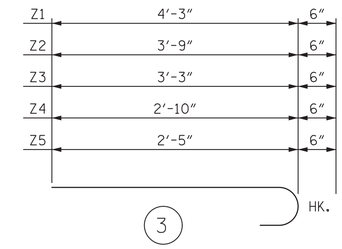
TYPICAL WING SECTION

BAR TYPES

ALL BAR DIMENSIONS ARE OUT TO OUT.







BILL OF MATERIAL

BAR	NO.	SIZE	TYPE	LENGTH	WEIGHT
H1	16	#4	STR	8'-1"	86
H2	8	#4	STR	6'-8"	36
H3	8	#4	STR	3'-1"	16
H4	40	#4	1	3'-3"	87
H5	8	#4	STR	8'-9"	47
N1	8	#4	2	8'-2"	44
N2	8	#4	2	7'-1"	38
N3	8	#4	2	6'-3"	33
N4	8	#4	2	5'-5"	29
N5	8	#4	2	4'-7"	24
T1	12	#5	STR	10'-0"	125
V1	8	#4	STR	6'-1"	33
V2	8	#4	STR	5'-1"	27
V3	8	#4	STR	4'-3"	23
V4	8	#4	STR	3'-5"	18
V5	8	#4	STR	2'-7"	14
Z1	8	#4	3	4'-9"	25
Z2	12	#4	3	4'-3"	34
Z3	8	#4	3	3'-9"	20
Z4	8	#4	3	3'-4"	18
Z5	8	#4	3	2'-11"	16

REINFORCING STEEL FOR 4 WINGS	793 LBS
CLASS A CONCRETE	
4 WINGS	13.8 CY
2 HEADWALL	2.1 CY
END CURTAIN WALLS	2.4 CY
TOTAL	18.3 CY

ASSEMBLED BY : D. H. CARTER	DATE : JAN 2016
CHECKED BY : M. T. NEIHEISEL	DATE : JAN 2016
DRAWN BY : CCJ 10/99	
CHECKED BY : RWW 03/00	

NORTH CAROLINA PROFESSIONAL SEAL 43031 ENGINEER MATTHEW T. NEIHEISEL

DocuSigned by: Matthew T. Neiheisel 84E31BF9E30749E...

2/18/2016

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NC License No: P-0258

PROJECT NO. P-4405K

ORANGE COUNTY

STATION: 51+53.00 -L-

SHEET 4 OF 5

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD WINGS FOR CONCRETE BOX CULVERT

H = 6'-0" SLOPE = 2:1
90° SKEW

REVISIONS						SHEET NO.
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STD. NO. CW9006

2/5/2016 ICA Engineering R:\Structures\Plans\c4_P4405K_sd_cw.dgn

0660DEL_P210

DICK

LOAD AND RESISTANCE FACTOR RATING (LRFR) SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS

LEVEL		VEHICLE	WEIGHT (W) (TONS)	CONTROLLING LOAD RATING (#)	MINIMUM RATING FACTORS (RF)	TONS = W × RF	STRENGTH I LIMIT STATE									COMMENT NUMBER
							LIVE-LOAD FACTORS (γ_{LL})	MOMENT				SHEAR				
								RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	RATING FACTOR	BOX NO.	ELEMENT TYPE	DISTANCE FROM LEFT END OF ELEMENT (ft)	
DESIGN LOAD RATING		HL-93 (INVENTORY)	N/A	(1)	**1.92**	--	1.75	**1.92**	1	TOP SLAB	**10.00**	2.05	1	TOP SLAB	9.70	
		HL-93 (OPERATING)	N/A		2.49	--	1.35	2.49	1	TOP SLAB	10.00	2.65	1	TOP SLAB	9.70	
		HS-20 (INVENTORY)	36.000	(2)	**1.92**	69.1	1.75	**1.92**	1	TOP SLAB	**10.00**	2.05	1	TOP SLAB	9.70	
		HS-20 (OPERATING)	36.000		2.49	89.6	1.35	2.49	1	TOP SLAB	10.00	2.65	1	TOP SLAB	9.70	
LEGAL LOAD RATING	SINGLE VEHICLE (SV)	SNSH	13.500		4.73	63.9	1.40	5.55	1	TOP SLAB	10.00	4.73	1	TOP SLAB	9.70	
		SNGARBS2	20.000		4.27	85.4	1.40	4.37	1	TOP SLAB	10.00	4.27	1	TOP SLAB	9.70	
		SNAGRIS2	22.000		4.20	92.4	1.40	4.20	1	TOP SLAB	10.00	4.46	1	TOP SLAB	9.70	
		SNCOTTS3	27.250		2.47	67.3	1.40	2.93	1	TOP SLAB	10.00	2.47	1	TOP SLAB	9.70	
		SNAGGRS4	34.925		2.75	96.0	1.40	2.79	1	TOP SLAB	10.00	2.75	1	TOP SLAB	9.70	
		SNS5A	35.550		2.64	93.9	1.40	2.83	1	TOP SLAB	10.00	2.64	1	TOP SLAB	9.70	
		SNS6A	39.950		2.57	102.7	1.40	2.61	1	TOP SLAB	10.00	2.57	1	TOP SLAB	9.70	
		SNS7B	42.000		2.56	107.5	1.40	2.59	1	TOP SLAB	10.00	2.56	1	TOP SLAB	9.70	
	TRUCK TRACTOR SEMI-TRAILER (TTST)	TNAGRIT3	33.000		3.53	116.5	1.40	3.53	1	TOP SLAB	10.00	4.15	1	TOP SLAB	9.70	
		TNT4A	33.075		2.84	93.9	1.40	3.03	1	TOP SLAB	10.00	2.84	1	TOP SLAB	9.70	
		TNT6A	41.600		2.65	110.2	1.40	2.80	1	TOP SLAB	10.00	2.65	1	TOP SLAB	9.70	
		TNT7A	42.000		2.72	114.2	1.40	2.81	1	TOP SLAB	10.00	2.72	1	TOP SLAB	9.70	
		TNT7B	42.000		2.68	112.6	1.40	2.80	1	TOP SLAB	10.00	2.68	1	TOP SLAB	9.70	
		TNAGRIT4	43.000		2.64	113.5	1.40	2.64	1	TOP SLAB	10.00	2.76	1	TOP SLAB	9.70	
		TNAGT5A	45.000		2.64	118.8	1.40	2.64	1	TOP SLAB	10.00	2.76	1	TOP SLAB	9.70	
		TNAGT5B	45.000	(3)	**2.36**	106.2	1.40	**2.36**	1	TOP SLAB	**10.00**	2.71	1	TOP SLAB	9.70	

LOAD FACTORS:

DESIGN LOAD RATING FACTORS

LOAD TYPE	MAX FACTOR	MIN FACTOR
DC	1.25	0.90
DW	1.50	0.65
EV	1.30	0.90
EH	1.35	0.90
ES	1.35	0.90
LS	1.75	--
WA	1.00	--

NOTE:

RATING FACTORS ARE BASED ON THE STRENGTH I LIMIT STATE.

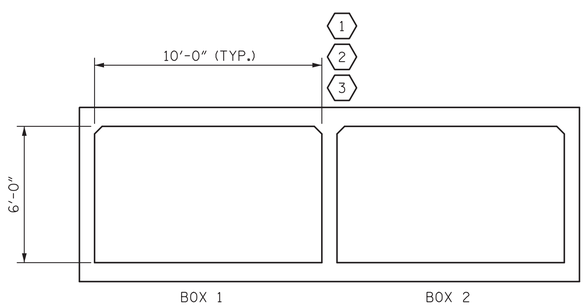
(#) CONTROLLING LOAD RATING

(1) DESIGN LOAD RATING (HL-93)

(2) DESIGN LOAD RATING (HS-20)

(3) LEGAL LOAD RATING **

** SEE CHART FOR VEHICLE TYPE



LRFR SUMMARY

(LOOKING DOWNSTREAM)

PROJECT NO. P-4405K

ORANGE COUNTY

STATION: 51+53.00 -L-

SHEET 5 OF 5

STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION
RALEIGH

STANDARD

LRFR SUMMARY FOR REINFORCED CONCRETE BOX CULVERTS
(NON-INTERSTATE TRAFFIC)

NORTH CAROLINA PROFESSIONAL SEAL 43031 ENGINEER MATTHEW T. NEIHEISEL

DocuSigned by: Matthew T. Neiheisel 84E31BF9E30749E...

2/18/2016

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STD. NO. LRFR5

ASSEMBLED BY : D. H. CARTER DATE : JAN 2016
CHECKED BY : M. T. NEIHEISEL DATE : JAN 2016
DRAWN BY : WMC 7/11
CHECKED BY : GM 7/11
REV. 10/1/11 MAA/GM

2/5/2016
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